

Massachusetts Bay Transportation Authority

Commuter Rail Executive Summary

Introduction

The Massachusetts Bay Transportation Authority (MBTA) is a body politic and corporate, and a political subdivision of the Commonwealth of Massachusetts formed in 1964 to finance and operate bus, subway, commuter rail, and ferry systems in the greater Boston, Massachusetts, area. The MBTA is committed to providing safe, reliable and efficient transportation to the region it serves.

The MBTA's Commuter Rail system is the fifth-busiest commuter rail in the country, after only New York and Chicago area systems. The lines go as far south as Wickford Junction, Rhode Island, and as far north as Newburyport, and they run as far west as Worcester, and Fitchburg Massachusetts. Trains either originate or terminate in Boston at either South Station or North Station. Both transportation hubs offer connections to Amtrak, local bus and subway lines. Currently a third party contractor operates and maintains the MBTA's Commuter Rail Service.

Service Area

The MBTA's commuter rail service area includes one hundred seventy-five (175) Commonwealth of Massachusetts communities, as well as Rhode Island. Commuter rail service is provided to one hundred and thirty-three (133) stations over six hundred sixty-four (664) revenue miles of track. The MBTA commuter rail trains operate over a network of fourteen lines, emanating from the two terminals in downtown Boston:

North Station

This is a 10-track station with five high-level platforms that can accommodate six to nine coach trains. On weekdays, one hundred ninety-eight (198) MBTA revenue trains serving areas north of Boston, plus Amtrak's Downeaster passenger service use North station. The five commuter rail lines that originate/terminate at North Station are:

- Fitchburg
- Lowell
- Haverhill
- Newburyport
- Rockport

Eastern Route (Newburyport/Rockport Line)

The MBTA owns and operates the Eastern Route. This branch runs northeast from North Station to Newburyport and Rockport. The main line runs from North Station through Newburyport for 34.9 miles and makes stops at 11 stations. The Gloucester branch splits from the main line at Beverly Depot station and runs east till Rockport, covering 16.8 miles and 8 stations along the segment. This route serves MBTA's commuter rail traffic, with an approximate weekly ridership of 18,023.

Western Route (Haverhill Line)

The Western Route runs straight north from North Station to Haverhill, serving 14 stations along the route. A station stop also exists at Oak Grove in Malden, but this stop is only used when the Orange Line rapid transit service is disrupted. The approximate length of the route is 32.1 miles. Owned by MBTA, this branch serves MBTA commuter rail traffic, with approximately 10,457 passengers commuting weekly. This line is connected to the New Hampshire Route via the Wildcat Branch.

New Hampshire Route (Lowell Line)

The New Hampshire Route runs north-west from North Station to Lowell, Massachusetts. This line is owned and operated by MBTA and approximately serves a weekly ridership of 12,569 commuter rail passengers, for 9 stations along the route. The approximate length of the New Hampshire Route is 24.5 miles. This line is connected to the Western Route by the Wildcat Branch.

Wildcat Branch

The Wildcat Branch is a single-track branch line which connects the New Hampshire Route at Wilmington Station to the Western Route at Wilmington Junction. The approximate length of the branch line between the connecting stations is 3 miles. This line is primarily used for passenger service by both the Amtrak Downeaster service from Boston to Portland, Maine, as well as the MBTA commuter rail for certain rush-hour Haverhill trains. The branch also carries some freight service by Pan Am Railroads.

Fitchburg Route

The Fitchburg Route runs west from Boston's North Station to Fitchburg, Massachusetts. This Line is the longest line in the system in terms of both length and travel time. It draws about 10,000 weekly riders for MBTA's commuter rail service, spanning across 17 stations and approximately 48.8 miles of track length. In 2009, the US Department of Transportation proposed the extension of the line from Fitchburg to include a new terminus. There is also a plan to upgrade the Fitchburg Line to have cab signaling.

South Station

This 13-track station can accommodate trains of six to fourteen coaches in length. On a typical weekday, this station handles over two hundred ninety-six (296) MBTA revenue trains serving the western and southern suburbs of Boston, plus Amtrak intercity passenger service. The nine commuter rail lines that originate/terminate at South Station are:

- | | | |
|---------------------------|--------------|-----------------------------|
| ▪ Greenbush | ▪ Stoughton | ▪ Franklin/Forge Park I-495 |
| ▪ Plymouth/Kingston | ▪ Providence | ▪ Worcester/Framingham |
| ▪ Middleborough/Lakeville | ▪ Needham | ▪ Fairmount |

Framingham/Worcester Line

The Framingham/Worcester Line runs west from South Station to Worcester, Massachusetts, though some trains terminate at Framingham, Massachusetts. From Boston to Framingham, this line is owned, maintained and operated by the MBTA. From Framingham to Worcester, the line is owned and operated by CSX. It is not PTC equipped. The line is partially cab signal equipped. The cab signaling extends from CP 21 (Framingham) to CP 44 (Worcester). The length of this branch is around 44.3 miles. It serves an average weekly ridership of 17,600 passengers and stops at 17 stations. In 2009, the Commonwealth of Massachusetts completed an agreement to purchase the tracks from Framingham to Worcester, with the actual transfer expected in 2011. Earlier phases of the agreement had allowed the addition of five weekday trains to Worcester.

Needham Branch

The Needham Branch Service runs from South Station to Needham, Massachusetts. This branch extends off the Southwest Corridor just west of Ruggles Station. Owned and operated by MBTA for its commuter rail service, this branch operates weekdays and Saturdays and serves a weekly ridership of 7,604 passengers. It spans across 9.3 miles, making stops at 11 stations. This branch is not cab signal equipped.

Franklin Branch

The Franklin Branch of MBTA Commuter Rail travels in a northeasterly direction toward Boston, Massachusetts from Franklin, Massachusetts. The branch extends from Forge Park Station to South Station and serves approximately 13,000 passengers on a weekly basis. This branch spans across 27.4 miles making stops at 16 stations along the route. This branch is not cab signal equipped. The Franklin Branch was later extended to Forge Park/495 but the MBTA decided to keep the name of the line the same. The line is sometimes referred as the Franklin/Forge Park Line.

Attleboro/ Providence Main Line

The Providence /Attleboro Main Line runs southwest from Boston, Massachusetts. This line carries service between South Station and Providence, Rhode Island. A part of this branch splits into Stoughton branch, which is operated solely by the MBTA. Within Massachusetts, this line is owned by MBTA. Beyond the state line of Massachusetts, in Rhode Island this line is owned and operated by Amtrak for its Northeast Corridor Rail service. ATC / ACSES is operational on the main branch. This main line serves an average weekly ridership of 19,181 passengers over 11 stations along the route and measures 42 miles in length. As part of the South County Commuter Rail initiative, a 20-mile extension is under construction past Providence to T. F. Green Airport and Wickford Junction in Rhode Island.

Stoughton Branch

The Stoughton Branch splits at the Canton Junction from the Attleboro / Providence Main Line and runs for two stations to Stoughton, Massachusetts. This branch serves MBTA's commuter rail traffic of around 8,682 passengers weekly and measures 4.6 miles.

Dorchester Branch (Fairmount Line)

The Dorchester Branch (or Fairmount Line), except for a short portion in Milton, lies entirely within Boston, and runs in the southwest direction from South Station to Readville. Most trains reverse direction at the south end at Readville. The Fairmount Line has 5 stations and approximately spans across 9.2 miles, serving an average of 1,843 passengers weekly on MBTA's commuter rail service.

Old Colony Lines

The Old Colony Lines are branches of the MBTA Commuter Rail system, connecting downtown Boston, Massachusetts with the South and Southeast. The Old Colony Lines are split into four segments – Middleboro Main Line, Greenbush, Plymouth Branch and Kingston Branch. The Middleboro Main Line segment runs south from South Station to Middleboro / Lakeville. This segment serves 9,700 weekly riders and stops at 10 stations along the 35-mile segment stretch. The Greenbush Branch runs east and then turns south along the shoreline, from South Station to Scituate, Massachusetts, serving a weekly average ridership of 4,500 passengers over 10 stations and 17.3 miles. The Kingston and Plymouth Branch segments turn southeast from Braintree Station and serve 7 stations, with an average weekly traffic of 10,350 passengers.

Operation

The MBTA's commuter rail services are provided by a contract operator and governed by an Operating Agreement administered by the MBTA Railroad Operations Department for a specified term. The Railroad Operations department provides oversight to ensure the contract operator meets the performance measurements and maintenance obligations of the Agreement. The contract operator is contractually obligated to operate and maintain the Authority's service equipment, service property and support property in accordance with the standards set forth in the agreement. The operating agreement also stipulates that the contract operator shall:

- “work with the MBTA to identify areas that can result in cost savings, such as, but not limited to maintenance materials, techniques or use of Third Party vendors”
- “test potential improvements to work methods used for maintenance and repairs on the Service Equipment”
- “recommend in an annual plan, all capital improvements, which in Contractor's estimation will enhance the delivery of Agreement Services”

Most of the right-of-way used for commuter rail is owned by the MBTA and maintained by the contract operator under the Operating Agreement. On most lines, the maximum speed for passenger service is 60 mph. However, the Attleboro Line (Northeast Corridor) has an allowable speed of 150 mph for some types of equipment, although commuter rail service is currently limited to 80 mph. The maximum allowable speed for passenger trains on the rebuilt Middleborough/Lakeville, Plymouth/Kingston lines and Newburyport extension is 70 mph.

Schedules

The current schedule (effective January 11, 2010) includes four hundred eighty-five (485) trains each weekday, with Saturday service on all of the fourteen lines and Sunday service on thirteen of the fourteen lines (Sunday service is not provided on the Needham Line). Schedules for the fourteen (14) lines can be found on the MBTA's web-site.

Additionally, the MBTA has offered special “bike train” service on its Rockport Line in the summer months of 2006 and 2007 and “ski train” service on its Fitchburg Line in the winter months of 2007 and 2008, with connecting shuttle buses to Wachusett Mountain. One passenger coach has been modified for use in these trains to be capable of carrying passengers and a large number of bicycles or skis and snowboards.

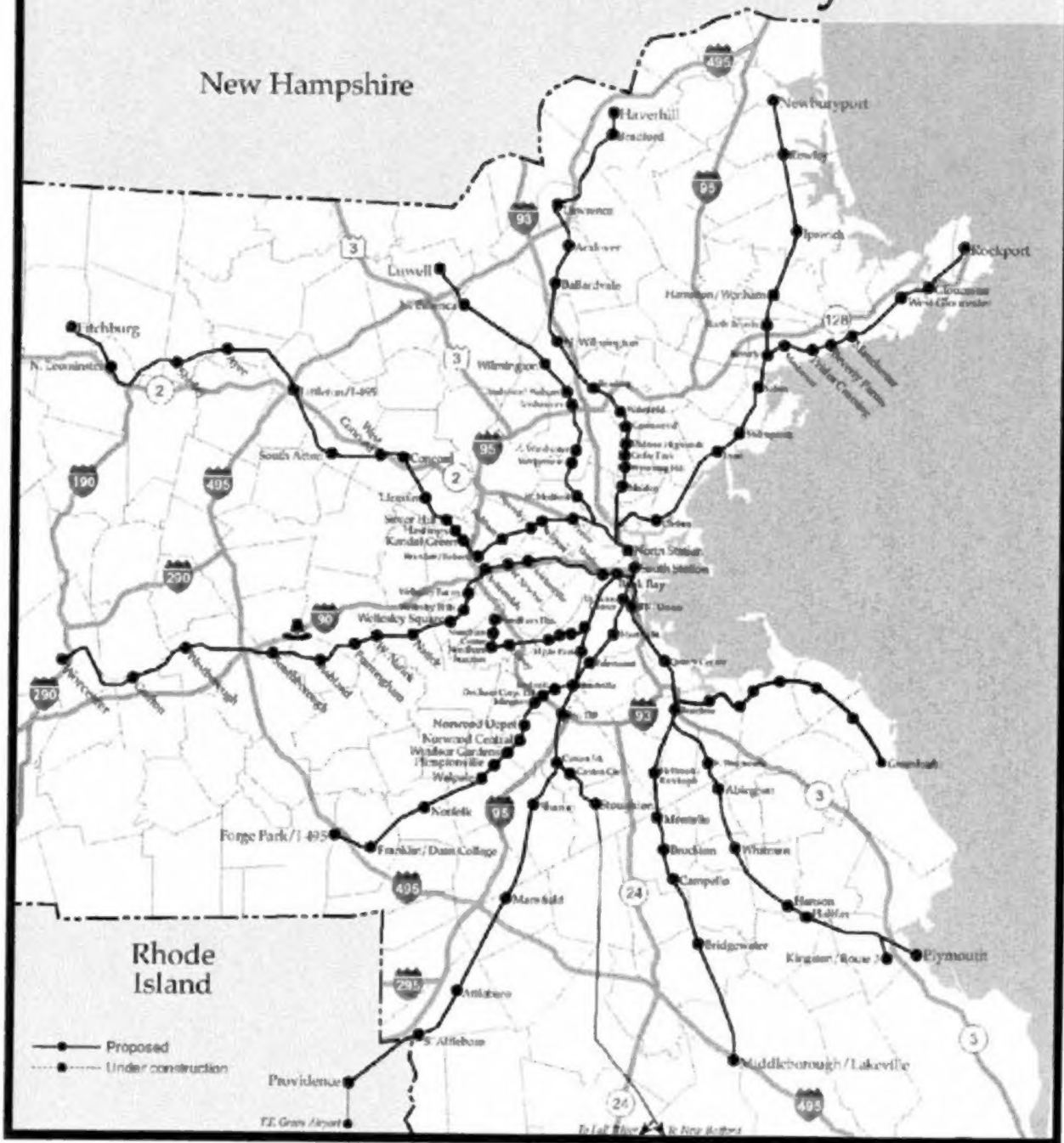
Special commuter rail service is also provided from Providence and South Station to Foxboro for Patriots games and special events. During baseball season, trains on the Framingham/Worcester line make extra stops at Yawkey station for Red Sox games.

Modified service is provided for the 4th of July and First Night Celebrations on New Year’s Eve, and extra service is added for Salem’s Haunted Happenings in October. A special Polar Express train is operated each December.

A network map delineating the commuter rail system is provided on the next page.

MBTA Commuter Rail System

New Hampshire



Current Ridership

After a brief decline in FY2004-FY2006, ridership on the MBTA's commuter rail lines increased again to a peak of 40,582,915 passengers in FY 2009. The results of the current economic downturn made a noticeable impact on ridership totals in FY 2010, with a nine percent (9%) reduction in total riders. Early FY2011 ridership shows a continued, albeit smaller, decline in ridership, but it is anticipated that ridership levels will increase again as the economy improves. Ridership from FY2003 through FY2010 is shown in the table and chart on the following pages.

MBTA Commuter Rail System Annual Ridership by Line

Line	FY: 2003	2004	2005	2006	2007	2008	2009	2010
Rockport/Newburyport	5,356,874	5,525,970	5,091,014	5,214,748	5,304,492	5,329,822	5,420,387	5,223,833
Haverhill	2,969,469	3,043,166	2,843,552	2,925,098	2,896,642	2,908,059	3,093,347	2,726,509
Lowell	3,246,674	3,238,649	3,055,565	3,186,318	3,454,175	3,513,388	3,617,508	3,366,940
Fitchburg	2,600,405	2,619,136	2,653,069	2,683,243	2,851,357	2,792,255	2,754,126	2,725,292
Subtotal Northside:	14,173,422	14,426,921	13,643,200	14,009,407	14,506,666	14,543,524	14,885,368	14,042,574
Framingham/Worcester	5,283,346	5,227,117	5,043,543	5,014,862	5,195,095	4,852,418	4,761,371	4,195,958
Needham	2,424,751	2,436,870	2,340,045	2,234,946	2,066,534	1,982,148	2,146,205	1,787,376
Franklin	4,523,556	4,209,694	4,035,211	3,680,989	3,576,198	3,541,312	3,705,649	3,448,109
Providence/Stoughton	7,757,047	7,602,652	7,091,925	7,042,079	7,589,825	7,504,112	7,828,003	7,330,061
Fairmount	731,722	599,182	548,163	508,829	496,563	467,066	394,971	290,965
Middleborough	2,898,865	2,744,362	2,549,552	2,630,551	2,670,415	2,643,981	2,720,092	2,277,798
Kingston/Plymouth	2,819,463	2,718,940	2,638,540	2,675,938	2,714,542	2,763,361	2,491,557	1,943,349
Greenbush	N/A	N/A	N/A	N/A	N/A	964,176	1,649,699	1,593,734
Subtotal Southside:	26,438,750	25,538,817	24,246,979	23,788,194	24,309,172	24,718,574	25,697,547	22,867,350
SYSTEM TOTAL:	40,612,172	39,965,738	37,890,179	37,797,601	38,815,838	39,262,098	40,582,915	36,909,924

Commuter Rail Fleet

The MBTA commuter rail revenue fleet is comprised of eighty-two (82) locomotives and four hundred ten (410) passenger coaches. All MBTA Commuter Rail service from both the North Station and South Station is provided by push-pull trains powered by diesel locomotives. The table below provides a summary of the different classes of locomotives and coaches in the revenue fleet.

Locomotives:

Builder	Model	Road Number	Active
EMD	GP40MC	1115 – 1139	25
EMD	F40PHM-2C	1025 – 1036	12
EMD	F40PH-2C	1050 – 1075	25 ¹
EMD	F40PH 2	1000 – 1017	18
MPI	MP 36PH-3C	10-11	2
		Total	82

¹ Locomotive Number 1073 was damaged in an accident and is no longer active.

Coaches:

Builder	Model	Road Numbers	BTC ²	CTC ³	Active
Kawasaki	CTC-4	1700 - 1724	-	25	25
Kawasaki	BTC-4	700 – 749	50	-	50
Kawasaki	BTC-4A	750 – 766	17	-	17
Kawasaki	BTC-4B	767 – 781	15	-	15
Kawasaki	BTC-4C	900 – 932	33	-	33
Bombardier	CTC-1B	1600 – 1651	-	51 ⁴	51 ⁵
Bombardier	BTC-1B	600 – 653	54	-	54
Bombardier	BTC-1A	350 – 389	40	-	40
MBB	BTC-3	500 – 532	33	-	33
MBB	CTC-3	1500 – 1533	-	34	34
Pullman Standard	BTC-1C	200 – 258	57	-	57
		Total	299	111	410

Locomotives

The locomotive fleet is comprised of vehicles of two major designs: the F40 and GP locomotives, both originally built by General Motors (GM).

F40PH-2 Locomotives

The eighteen (18) F40PH-2 units were purchased in 1978 – 1980. and are equipped with a turbocharged, 16-cylinder diesel engine that that develops up to 3000 HP. The main generator converts this mechanical energy into electrical energy, which is delivered to four traction motors for tractive effort. These are the only units with a single engine to provide both tractive effort and head end power.

F40PH-2C Locomotives

The twenty-five (25) F40PH-2C locomotives were delivered in 1987 – 1988 and are equipped with a turbocharged, 16-cylinder diesel engine that that develops up to 3000 HP. The main generator converts this mechanical energy into electrical energy, which is delivered to four traction motors for tractive effort. . A secondary engine / generator system, referred to as Head End Power (HEP), produces 600 kilowatts (KW) of alternating current (AC) power to operate the heat ventilation and air conditioning (HVAC), communications system and lights for the coaches.

F40PHM-2C Locomotives

The twelve (12) F40PHM-2C locomotives were purchased in 1991 – 1993 and completed a mid-life overhaul program in October 2004. These units are equipped with a turbocharged, 16-cylinder diesel engine that develops up to 3000 HP. The main generator converts this mechanical energy into electrical energy, which is delivered to four traction motors for tractive effort. A secondary engine / generator system, referred to as Head End Power (HEP), produces 600 kilowatts (KW) of alternating current (AC) power to operate the heat ventilation and air conditioning (HVAC), communications system and lights for the coaches.

² BTC means Blind Trailer Coach, see the glossary in the appendix for a definition of a BTC.

³ CTC means Control Trailer Coach, see the glossary in the appendix for a definition of a CTC.

⁴ Cab controls in twenty-five (25) of the Bombardier CTC-1B coaches (car numbers 1600-1624) have been deactivated.

⁵ Coach 1648 was damaged in an accident and is no longer active

GP40MC Locomotives

The twenty-five (25) GP40MC locomotives were built in 1974 – 1975 by GM and remanufactured by ALSTOM in 1997 – 1998. These units are equipped with a turbocharged, 16-cylinder diesel engine that develops up to 3000 horsepower (HP). The main generator converts this mechanical energy into electrical energy, which is delivered to four traction motors for tractive effort. A secondary engine / generator system, referred to as Head End Power (HEP), produces 500 kilowatts (KW) of alternating current (AC) power to operate the heat ventilation and air conditioning (HVAC), communications system and lights for the coaches. These remanufactured units feature a switcher style car body, microprocessor power / excitation, cab signal and braking systems.

MP36PH-3C Locomotives

The two (2) MP36PH-3C locomotives were delivered in 2010 and are equipped with a turbocharged 16 cylinder diesel engine that develops 3600 horsepower. The main generator converts this mechanical energy into electrical energy which is distributed through the high voltage cabinet to the traction motors. Each of the four traction motors is directly geared to a pair of driving wheels. This model has 60:17 gearing and a maximum operating speed limit of 79 MPH. The MP36PH-3C is equipped with a 600 kW Head End Power (HEP) generating system consisting of a Caterpillar C18 Series dual turbocharger diesel engine driving a Marathon alternator that produces alternating current (AC) power to operate the heat ventilation and air conditioning (HVAC), communications system and lights for the coaches.

Single Level Coaches

The MBTA fleet has two types of coaches in revenue service: Control Trailer Coaches (CTC) and the Blind Trailer Coaches (BTC). A CTC includes an operator's cab and is used to operate the train in the push mode utilizing pneumatic and electric trainlines to control the locomotive in the rear of the train. There are currently one hundred eleven (111) CTCs and two hundred ninety-nine (299) BTCs in the MBTA's commuter rail fleet; twenty-five (25) of those CTCs have had their controls deactivated and are used as BTCs. Of those four hundred ten (410) coaches, two hundred seventy (270) are single-level and one hundred forty (140) are bi-level.

Bombardier Coaches (300, 600 and 1600-series)

The one hundred forty-six (146) Bombardier coaches are comprised of two coach classifications. The first classification, the "300" series, was purchased in 1987 and includes forty (40) BTCs with a seating capacity of 127 each.

The second classification of Bombardier coaches is the "600 / 1600" series, which were delivered in 1989 – 1990. The 600-series portion of this classification consists of fifty-four (54) BTCs with a seating capacity of 122 each. The 1600-series portion of this classification consists of fifty-two (52) CTCs, of which only twenty-seven (27) still have active cab controls. If needed, the cab controls in the other twenty-five (25) 1600-series coaches could be restored via an in-house program. Each of these coaches has a seating capacity of 122.

Coach 1648 was damaged in a collision in 1998 and scrapped in 2005.

MBB Coaches (500 and 1500-series)

The sixty-seven (67) Messerschmitt – Bolkov – Blohm (MBB) coaches were delivered in 1987 – 1988. These vehicles are equipped with restroom facilities. There are thirty-four (34), “1500” series CTCs with a seating capacity of 96 and thirty-three (33), “500” series BTCs with a seating capacity of 94.

Pullman Standard Coaches (200-series)

The fifty-seven (57) Pullmans Standard coaches were manufactured and purchased in 1978 – 1979 and overhauled in 1995 – 1996 by Amerail. All Pullman coaches are BTCs with a seating capacity of 114 and car numbers in the “200” series.

Bi-Level Coaches

Kawasaki Coaches (700 and 1700-series)

Seventy-five (75) Kawasaki high-capacity bi-level passenger coaches were purchased in 1990 – 1991. Fifty (50) of the coaches are blind trailer coaches with a seating capacity of 185 and twenty-five (25) are control trailer coaches with a seating capacity of 175.

Seventeen (17) additional bi-level trailer coaches were purchased from Kawasaki in 1997 by exercising an option of the original contract. All of the option coaches are blind coaches and have a seating capacity of 182.

Fifteen (15) bi-level trailer coaches were purchased in 2002, also by exercising an option of the original Kawasaki contract. All of the coaches are blind trailer coaches and have a seating capacity of 182.

These first one hundred seven (107) Kawasaki coaches are all included in two car classes, the “700” series for BTCs and the “1700” series for CTCs.

Kawasaki (900-series)

A new series of bi-level coaches, the 900-series, with ADA compliant restrooms were purchased from Kawasaki Rail Car in 2005 – 2006. These thirty-three (33) coaches are all BTCs, and are much like the 700-series coaches, but with several upgrades. In addition to the ADA-compliant restrooms, some of the most prominent upgrades that were incorporated into the 900-series coaches include the addition of a passenger emergency intercom system, a microprocessor-controlled HVAC system and door obstruction detection.

Current Procurement

Seventy-Five (75) Hyundai-Rotem Bi-Level Coaches (800-series and 1800-series)

This procurement is currently nearing the end of the engineering phase. Delivery of the production cars is anticipated in FY 2013. At the specified delivery rate of 4 per month, this indicates that by the middle of FY 2014, all of the new bi-level cars should be available.

Twenty (20) HSP46 Locomotives

This procurement has been awarded to Motive Power, Inc. (MPI). It is anticipated that the first production locomotives may begin to arrive in FY2013. The contract includes an option for up to an additional twenty (20) locomotives.

Maintenance Facilities

Railroad Operations has three mechanical maintenance facilities and eleven active layover facilities:

Commuter Rail Maintenance Facility – Boston Engine Terminal (CRMF – BET)

A state of the art facility is located in Somerville consisting of more than eight acres within one building located approximately one mile west of North Station. The CRMF – BET has a three-track “service & inspection” area with train washing capabilities, two tracks for periodic maintenance, a wheel truing track, coach, locomotive and truck repair shops, engineering support shops, material storage as well as welfare and administrative areas. The facility also has a ten-train midday storage yard equipped with ground power and air.

Southside Service and Inspection Facility

A two-track structure with two exterior tracks is located at Widett Circle in South Boston approximately one mile south of South Station. This facility can accommodate two nine-coach trains and provides for fueling, sanding, train washing and running repairs. One of the exterior tracks can accommodate a nine-coach train for fueling and topping off fluids.

Readville

This facility was constructed as part of the interim maintenance phase of the CRMF – BET reconstruction project. It has a Butler type building, consisting of three tracks with a wheel-truing machine, capable of storing six coaches. Adjacent to this facility is a midday storage yard with electric ground power and yard air.

Layovers

Situated at the outlying end of most of our lines are yards where the trains are stored overnight. Electric ground power is available so the locomotives can be shut down and plugged in to prevent possible cold weather damage and eliminate idling. This also allows for maintenance and cleaning during the night. The layover areas are located in Newburyport, Rockport, Bradford, Fitchburg, Worcester, Needham, Franklin, Kingston, Middleboro, Pawtucket and Scituate. The Lowell and Attleboro layovers are presently inactive.

Maintenance Philosophy/Standards

The MBTA’s maintenance philosophy in this Fleet Management Plan is to:

- Maintain rolling stock in order to provide safe, efficient and reliable revenue service for the commuting public.

- Adhere to the manufacturers' recommendations for maintenance practices, modified for current operating conditions, to maximize the useful life of the equipment.
- Comply with all FRA, EPA and Association of American Railroads (AAR) regulations as well as American Public Transit Association (APTA) standards.
- Develop programs and schedules for procurements and overhauls for both locomotives and coaches consistent with the future needs of Railroad Operations while maintaining compatibility with the current fleet.

Schedule Requirements

The MBTA commuter rail schedules are established to meet passenger demand. The MBTA's Service Policy allows for 1.1 passengers per seat at the peak load point, and requires at least three peak-direction trips per branch in each peak period. During the non-peak periods, headways should not exceed 180 minutes. The current schedule provides four hundred ninety-four (494) weekday trips using sixty (60) train sets.

Twenty-three (23) trains with a total peak requirement of one hundred twenty-eight (128) single level coaches operate to and from North Station. Thirty-seven (37) train sets operate to and from South Station, with total peak requirement of one hundred twenty-five (125) bi-level coaches and one hundred three (103) single level coaches. South side trains have a mixture of single-level and bi-level coaches, while north side trains currently use only single-level coaches. All train sets are scheduled for passenger service; there are no protect or standby trains. The number of peak and non-peak weekday trips for each line is shown in the table below.

Branch	AM Peak	PM Peak	Non-Peak	Total
South Side Total	52	46	198	296
Greenbush	5	5	14	24
Plymouth/Kingston	5	4	19	28
Middleborough/Lakeville	4	4	16	24
Stoughton	4	6	26	36
Providence	8	5	21	34
Franklin/Forge Park I-495	7	6	24	37
Needham	5	5	22	32
Worcester/Framingham	9	7	25	41
Fairmount	5	4	31	40
North Side Total	34	29	135	198
Fitchburg	6	6	22	34
Lowell	10	7	37	54
Haverhill	8	6	32	46
Newburyport	7	6	25	38
Rockport	3	4	19	26
System-wide Total	86	75	333	494

Train Set Requirements

The Authority follows a multi-step process to determine vehicle requirements for passenger service schedules. Arrangement of vehicles to operate the schedules takes into consideration several

factors, including passenger demand, vehicle constraints, infrastructure constraints, and MBTA policies.

Trains operate in the push-pull mode with the locomotive leading (pull mode) when departing from Boston and with CTC leading (push mode) when arriving in Boston. The length of train, or consist, depends on passenger demand. A minimum consist of four coaches is required to maintain effective braking and operational flexibility, and a maximum of one locomotive and eight coaches exists due to station platform lengths. It is MBTA policy for every train to have one coach with a functioning restroom.

Branch	Required	Actual	Variance
South Side			
Bi-Levels	126	124	(2)
Single Level	102	101	(1)
Total	228	225	(3)
North Side			
Bi-Levels	5	3	(2)
Single Level	123	130	7
Total	128	133	5
	Required	Actual	Variance
Total			
Bi-Levels	131	127	(4)
Single Level	225	231	6
Grand Total	356	358	2
Locomotives	60	62	2

Current Signal System

The MBTA signaling systems consist of Automatic Block Signaling (ABS) with and without Cab Signaling/Automatic Train Control system. The existing landline and microwave communication systems support the signal systems. In the southern division with the exception of half of the Framingham/Worcester Line and Needham Line and Franklin Line, all are Cab Signal equipped and operate under ATC rules. The Shore Line which is part of the subdivision is also ACSES equipped. Currently, this is the only line in full compliance with FRA PTC requirements.

On the North Side, the existing train control system consists of the ABS without ATC. The MBTA back office supports all the North Side lines.

All lines north and south have wayside signals for traffic control. All MBTA vehicles are FRA compliant ATC and ACSES II equipped and in full compliance with NORAC time table requirements with the exception of the Bombardier Cab Control Coaches. The Bombardier Cab Control Coaches are equipped with ATC but have not been equipped with ACSES II to date.

Existing Wayside Communications Infrastructure

MBTA's right-of-way employs a mix of fiber optics, copper (electrical) and wireless communications plant infrastructure (backhaul) to transport information throughout the MBTA property, and primarily to the North Side and South Side control centers (back office). The North Side and South Side control centers are linked via a fiber optic link. Some locations employ multiple communication methods to transfer information to specific locations or onto a network.

Wireless

For North and South Lines, 900MHz radios are used for data communications and 160MHz radios are used primarily for voice communications.

Microwave links are employed throughout MBTA's property too, as higher rate/bandwidth communication links.

Hard Lines

Various owned and leased electrical and optical communications topologies, bandwidths and terminal equipment exist on MBTA's property.

These types are: T1, DS3, Fast Ethernet, SONET interface points, 4-Wire, DSL and high throughput WDM.

- Note: MBTA interfaces to an AMTRAK SONET system on the South Side, with Add-Drop points for the South Side control center, Back Bay Station, Stoughton Branch, Readville/Hill, Pawtucket Layover and Needham Branch.

Existing Central Operations

Two control centers operate MBTA's Lines from central locations:

- The North Side control center for North Station to Fitchburg, Lowell, Haverhill, Newburyport and Rockport Lines.
- The South Side control center for South Station to Worcester, Needham Heights, Readville, Forge Park, Providence, Stoughton, Middleborough, Kingston/Plymouth and Greenbush Lines. The South Side facility also houses a CTEC room for Amtrak NEC operation, which includes the Shore Line.

Draw Bridges

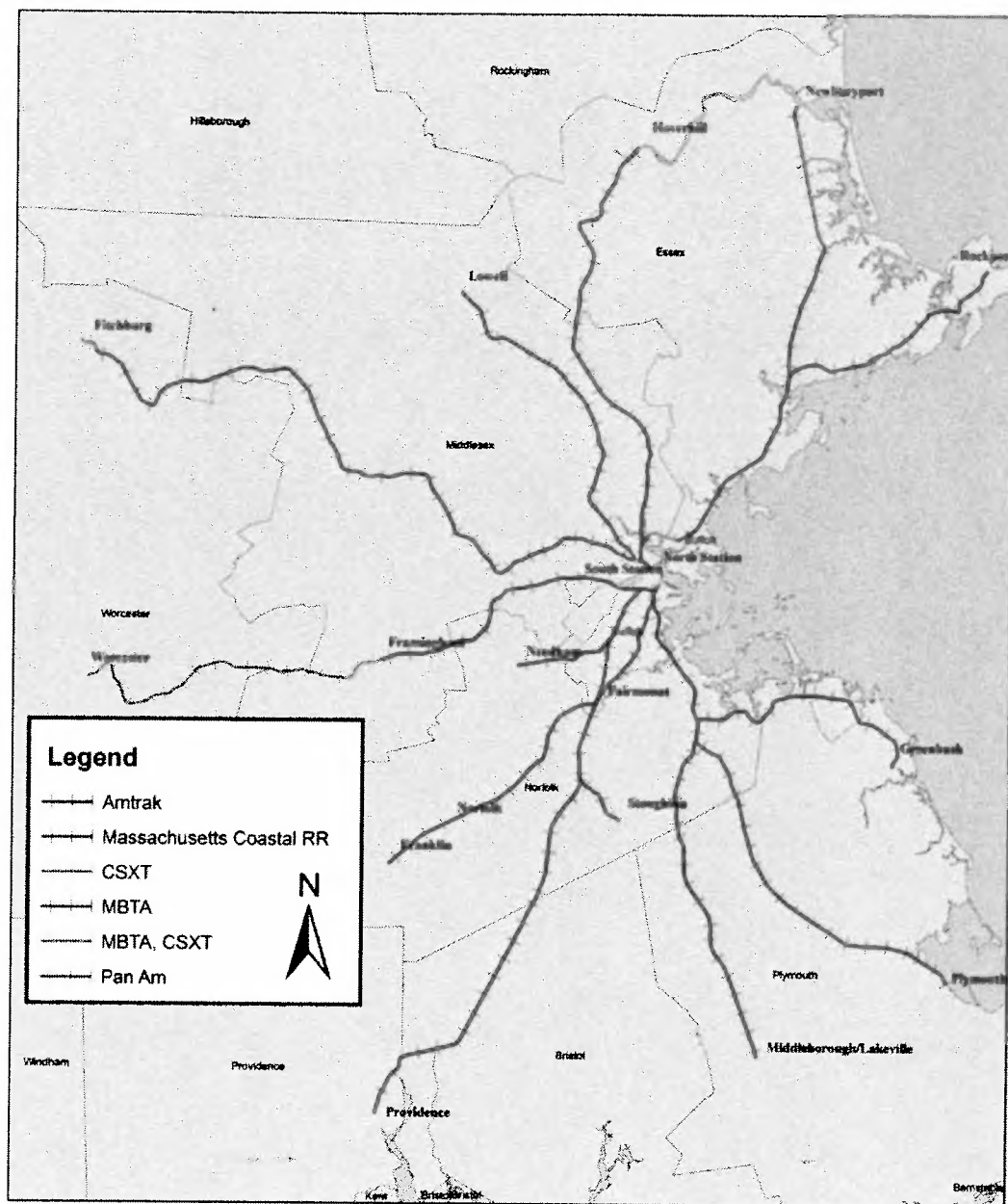
Draw One (near North Station, Boston) was built in 1931. There are two (2) side by side thru truss bascule drawbridges known as East and West Drawbridges. These drawbridges have experienced some mechanical problems and now are under design for replacement within the next 5 years.

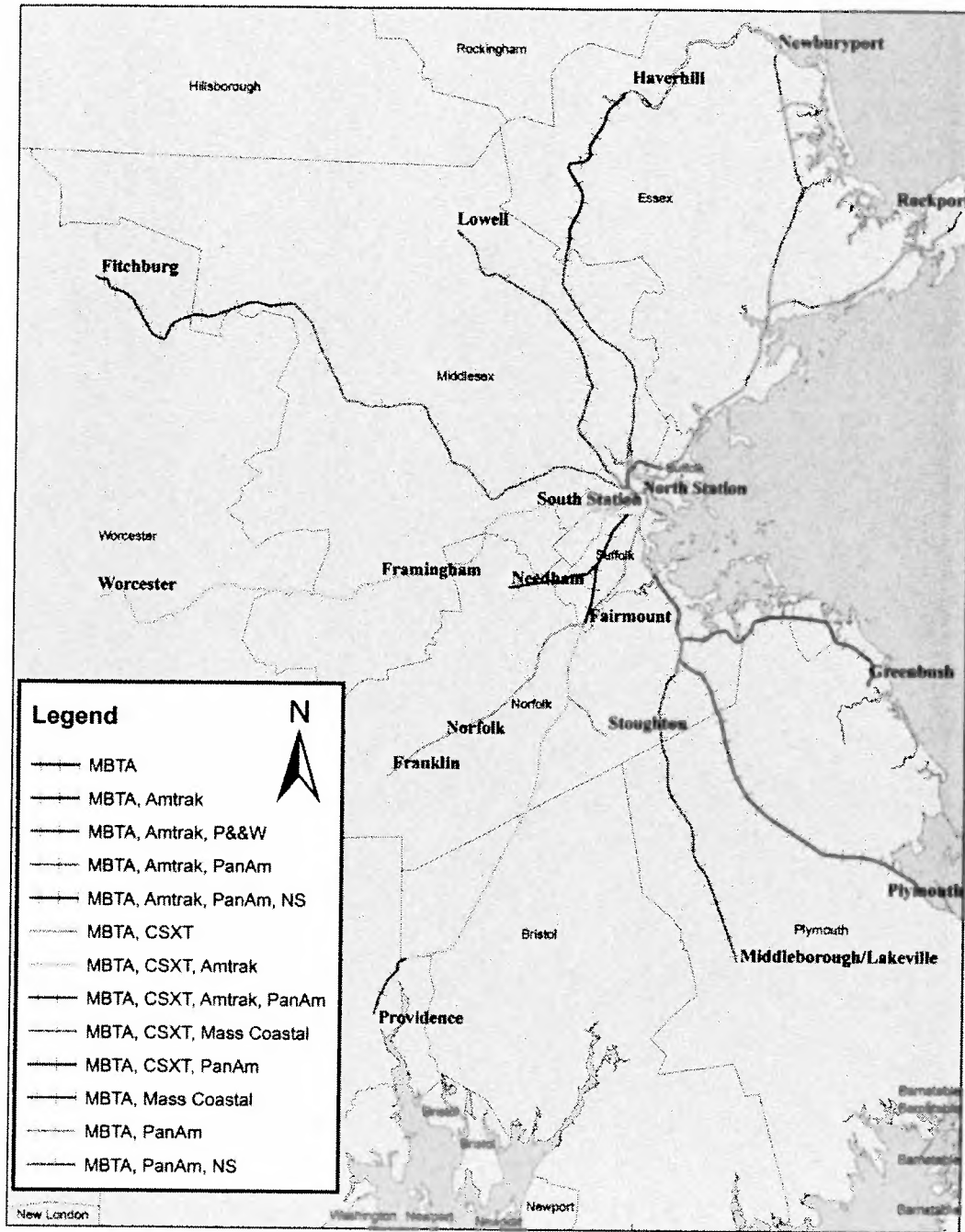
Saugus Drawbridge (Lynn) was built in 1911, which is a thru girder bascule drawbridge. Many repairs have been done to several mechanical components and recently repairs were done to superstructure (stringers) and timbers at the conley frogs. This bridge is not under design; however, one of the approach piers (Pier 6) is due for major renovations.

Beverly Drawbridge (Beverly) was built in 1886. This bridge is a deck plate girder **swing** span drawbridge. Many repairs have been done to the swing machinery including: replacing the mechanical assembly damage (from a barge about 4 years ago), replacing electrical terminals, replacing the coupling at the reducer, and replacing of Bronze Nuts at least twice per year. The wedge assembly is about to be converted from mechanical to hydraulic locks; however the entire mechanical controls of the bridge are under design for replacement within the next 5 years.

Manchester Drawbridge (Manchester) was built in 1944. This bridge is a thru girder bascule drawbridge similar to Draw One and Saugus Drawbridge. While minor repairs have been done to the components, the timbers and conley pads are due for replacement in the spring 2012. This drawbridge is not under design at this time.

Gloucester Drawbridge (Gloucester) was built in 1911. This bridge is a deck plate girder drawbridge. Many repairs have been done to both the mechanical and structural components. Recently, three (3) trunnion bearings were designed and replaced. This bridge is under design for replacement within the next 5 years.





Operating Railroads